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European Energy Security: Reducing Volatility of Ukraine-Russia Natural Gas Pricing Disputes

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Key Points

- As Russia positions itself for a long-sought Gazprom takeover of Ukrainian infrastructure, the European Union must consider a serious investment in Ukraine to prevent complete Russian control over its energy security.
- Despite recent agreements between Russia and Ukraine over natural gas pricing, the fundamental issues that caused the shutoff of gas to Europe in 2009 remain largely unresolved, and a future shutoff remains a strong possibility.
- Proposed alternative pipelines will not alter the key role Ukraine plays in European access to Russian gas, and independent reforms of its energy sector are unlikely to succeed without foreign investment.

On January 7, 2009, the existing energy relationship among Europe, Russia, and Ukraine broke down over a natural gas dispute, just as it had done 3 years earlier. Amid subzero temperatures in many parts of Europe, Russia turned off its gas supply to Ukraine, causing shortages in more than 20 European countries. Thousands across the continent were left in the dark, and government services were closed.[1] While the flow of gas was eventually restored, Russian gas disputes with Ukraine continue, and the prospect of another Gazprom shutoff has become an annual event for European consumers. Despite earlier indications that another breakdown in negotiations would lead to blackouts in Europe early in 2010, the potential crisis was averted via a Russia-Ukraine deal that restructured earlier payment and pricing arrangements.[2] However, it is doubtful that Ukraine can continue timely payments for its domestic gas consumption and maintain its own pipeline infrastructure. Fundamental changes to Russia-Ukraine energy transport agreements are coming.

The annual game of gas brinkmanship played by Russia and Ukraine is of strategic significance for the United States and its allies for two main reasons. First, when talks break down, Europe suffers. If the current situation continues, at best, Europe must live with continuing energy insecurity; at worst, a total breakdown of negotiations between the supplier and transit country could leave many European countries without heat or electricity. Equally important, however, is that this problem's resolution will have important implications for power politics in the region. Russian Prime Minister Vladimir Putin has argued that Russian power in Eastern Europe depends on its role as Europe's

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energy arbiter. Russia is currently attempting to resolve the dispute with Ukraine by increasing its control over that country's gas transit infrastructure, a solution that would significantly boost Russia's ability to use gas as a political lever against states within the region. The United States has an interest in supporting solutions that will decrease the vulnerability of its European allies to potential Russian pressure.

This paper diagnoses the long-running problem and evaluates the options and opportunities for limiting the impact of future gas pricing disputes on energy security in Europe. There are a number of possibilities for alleviating this problem, including building additional pipelines to bypass Ukraine, developing an international gas consortium between Russia and the European Union (EU), and carrying out reforms to the Ukrainian energy sector. The parties are actively exploring all of these options. Unfortunately, these solutions are partial at best and will not resolve the broader problem. While there is no single solution that will create a secure gas market, the most practical ways to limit the impact of pricing disputes between Russia and Ukraine are to restrict the means by which these two actors can pressure each other and to increase transparency in the transit process. The best way to achieve this outcome is for the EU to increase investment in Ukraine's transit infrastructure.

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Nature of the Problem

In Europe, natural gas politics form an enduring economic and political challenge. In its current form, the institutional framework that supplies gas to Europe is based upon the stability of regularly renegotiated agreements between gas supplying and gas transit countries. This system is crisis prone and vulnerable to disruption. While an armed conflict over natural gas transit is highly unlikely, recurring gas disruptions in recent years and brinkmanship during pricing negotiations have led to significant loss of revenue for Russia and considerable hardship in Europe. In the most recent dispute, over the course of a few days, Gazprom lost more than $1 billion during the shutdown and millions of consumers in European countries were left without heat in the middle of winter.[3]

Europe's dependence on cooperation between Russia and Ukraine represents a serious and growing problem. Currently, the EU depends on natural gas for over 22 percent of its electricity.[4] This figure is deceptively low. In reality, many members, including Bulgaria, Estonia, Finland, Latvia, Lithuania, Romania, and Slovakia, are entirely or almost entirely dependent on Russian gas for home heating and electricity generation. Other members, such as Greece, the Netherlands, and Hungary, import significant amounts as well. Of the largest states with diversified energy sources, Germany and Italy are substantially dependent (30–35 percent) on Russian gas imports, and any shortfall would have a drastic impact on their economies. The smaller members are particularly vulnerable due to lack of storage facilities. Overall, in 2007, the EU imported 40.8 percent of its gas from Russia,[5] 80 percent of which was carried by Ukrainian pipelines.[6]

With European demand increasing and European supplies dwindling, this dependency will increase further over time. It is likely that there will be a significant rise in the use of natural gas for electricity, home heating, and industry—and this increase will be met by a heightened dependency on imports. Eurogas estimates that EU natural gas demand will grow by 14 to 23 percent by 2030; with European domestic production in decline, Russia will supply the vast majority of this demand via pipelines transiting Ukraine.[7] These figures include the possibility

European Gas Imports from Russia by Country as Percentage of Total Consumption

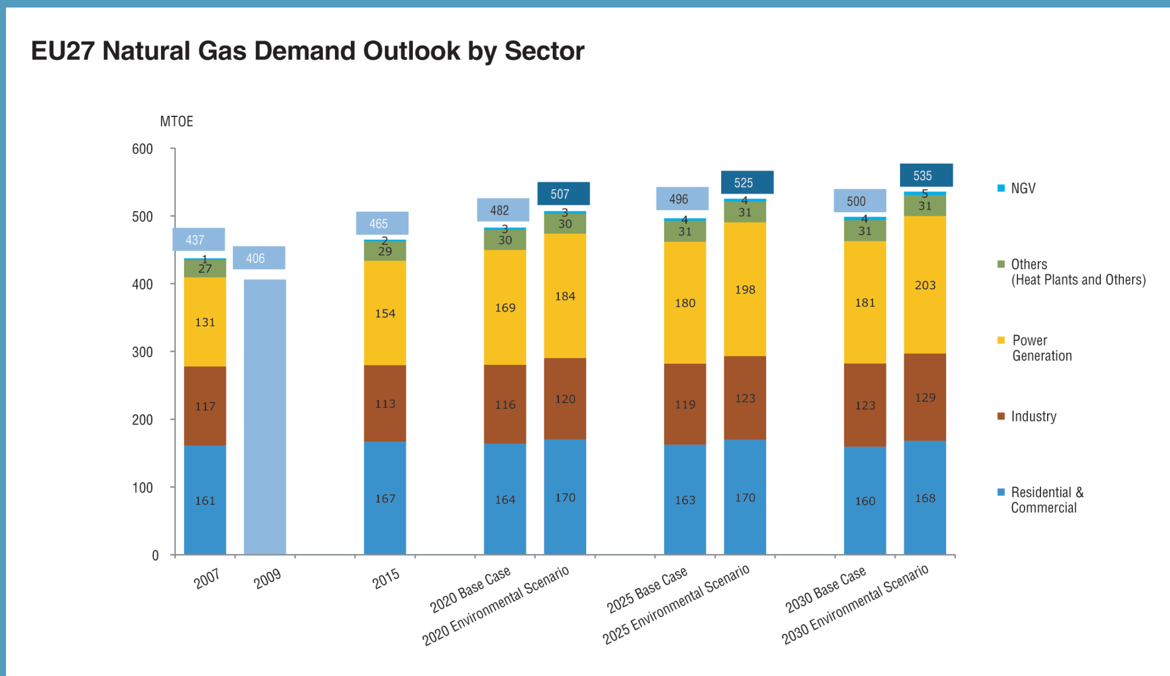
European Union (27 countries)	% Gas Imported from Russia
Austria	58
Belgium	0
Bulgaria	100
Cyprus	0
Czech Republic	78
Denmark	0
Estonia	N/A
Finland	100
France	19
Germany	40
Greece	60
Hungary	71
Ireland	0
Italy	29
Latvia	N/A
Lithuania	100
Luxembourg	0
Malta	0
Netherlands	11
Poland	52
Portugal	0
Romania	15
Slovakia	96
Slovenia	49
Spain	0
Sweden	0
United Kingdom	0

Source: BP Global Statistical Review of World Energy, June 2010. Supplemental data from *CIA World Factbook*.

of drastic improvements in energy efficiency and use of renewable sources.

The current situation represents a different type of problem for each of the three major players. From the perspective of European gas consumers, the central problem is that both Russia and Ukraine regularly use the tacit threat of cutting off Europe's gas supply as a bargaining chip during gas transit negotiations. The roots of the problem lie in a combination of history and geography. During the Cold War, the Soviet Union built gas pipelines through

Increase in Gas Use by Sector (Eurogas Estimates)



Eurogas estimates for the long-term outlook of natural gas demand show significant increases in the power generation sector. The Base Case Scenario assumes continued development of gas infrastructure, with current energy and environmental policies sustained. The Environment Scenario is based on faster economic recovery estimates with greater reliance on natural gas rather than nuclear power as a clean source of energy. Eurogas indicates that by 2015, additional contracts for gas supplies will be required, with the overwhelming majority of new demand to be met by imports from outside the EU zone.

***Key*: MTOE = million tonnes of oil equivalent; NGV = natural gas vehicle**

***Source:* Eurogas, "Long Term Outlook for Gas Demand and Supply, 2007–2030," available at <www.eurogas.org/>. Eurogas membership is composed primarily of companies in the European energy and natural gas industries, with some nonprofit organizations.**

Ukraine to supply Eastern Europe. In exchange for gas transit, Moscow supplied Ukraine with natural gas at a substantial discount but exercised control over the terms of the exchange. This arrangement persisted beyond the end of the Cold War, but with decreasing levels of Russian control until Ukraine's largely anti-Russian Orange Revolution in 2004. Since the election of President Viktor Yushchenko in 2005, Russia and Ukraine have been locked in a dispute over terms of transit, and when negotiations break down, Europe loses access to gas.

From the Russian perspective, the economic and diplomatic stakes involved in its contract negotiations with Ukraine are substantial. On the geostrategic level, Russia's economic history with Eastern Europe and its

geographical position as a bridge between Central Asia and Europe position it to benefit substantially from its gas trade. With a near monopoly on gas transport to Europe, Russia buys Central Asian gas at a substantial discount and transports it to European markets, where it sells the gas to friendly states at or below the price it pays and to other states at a considerable markup. This monopoly has come under strain in recent years as China has increasingly provided an alternative market for Central Asian gas, forcing Russia to raise the prices it charges Eastern European states, though its overall position as the arbiter of Central Asian gas prices remains strong. This position provides it with considerable leverage over gas-dependent former Soviet states and a useful tool with which to coerce the governments of Western Europe.[8] From an economic standpoint, the Russian government relies on revenues from Gazprom's exports to Europe for close to 20 percent of its operating budget. Putin has argued that Russia's major power status depends on its role as an energy arbiter. The fact that it must depend on Ukraine to transport 80 percent of the gas it exports to Europe is a continual source of frustration to Russia and a threat to its reputation as a major power.

For Ukraine, this contest of wills with Russia is about both economic survival and national pride. Ukraine relies on Russia for the bulk of its energy needs. Around 75 percent of the gas Ukraine uses enters the country through Russian pipes, and around half of Ukraine's total energy consumption comes from natural gas.[9] Most Ukrainian homes are heated by natural gas; steel and other export industries are almost completely dependent on gas. Losing access to this gas would devastate Ukrainian industry and ravage the economy as a whole. Added to this, Ukraine depends on Russian gas transit fees and subsidies for around 2 percent of its gross domestic product (GDP).[10] Further complicating the negotiations is the fact that Ukrainian citizens perceive their country's geostrategic location as Europe's gas arbiter with nationalistic pride and value their ability to use this position to preserve their autonomy from their former Soviet rulers. Thus, the country's leaders find themselves pulled in three directions. In the first place, they must ensure access to Russian gas. In the second, they must secure the best possible transit fees and purchase discounts. Finally, they must promote gas policies that appeal to voters' concerns about growing Russian hegemony.

Ukraine's situation is made still worse by the dependence of its economy on inexpensive fuel. After half a century of extraordinarily cheap gas, Ukraine has become one of the most energy-inefficient nations in the world. Any move to raise gas prices to market levels would likely make Ukrainian industry uncompetitive in global markets. Coupled with voter expectations of continued low heating costs, raising gas prices has, until recently, been politically unacceptable. As a result, Ukraine's gas company, Naftogaz, sells gas to Ukrainian consumers at rates lower than the price at which it buys the gas from Russia's Gazprom and operates at a loss. The company is continually on the verge of bankruptcy, forced to depend on state assistance to remain viable.[11] Problems with this highly subsidized system are exacerbated by decaying transit infrastructure, endemic corruption, and a general lack of transparency. While this system of subsidies is not economically rational, changing it would involve significant political and economic dislocations that would be damaging to existing political power brokers.

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Given this background, a destructive bargaining game over the price of gas and the cost of transit has evolved between Russia and Ukraine during the past two decades. Russia not only attempts to transport gas through Ukrainian infrastructure to Europe at the lowest

rates possible but also uses threats of higher gas prices to influence Ukrainian politics. Ukraine attempts to extract the highest transit fees possible from Russia using open negotiations. It also uses the opacity and decrepitude of its transit infrastructure to siphon off Russian gas intended for Europe, with some level of plausible deniability for government leaders, and uses its economic problems to excuse late or non-payment of billions of dollars of gas debts to Gazprom.

the history of the gas dispute between Russia and Ukraine has its roots in the end of the Cold War

In this bargaining arrangement, both Russia and Ukraine hold significant economic weapons but cannot use them without suffering themselves. If Ukraine's failure to pay its gas debts becomes too costly or its diplomacy becomes too Western, Russia has the option of stopping sales of gas to Ukraine, as it did in 2006 and 2009, with devastating effects on Ukraine's economy. However, if Russia takes this action, Ukraine can respond by cutting off the flow of Russian gas to Europe, again as happened in 2006 and 2009, an action that hurts Russia's government economically, humiliates it politically, and damages its reputation in Europe as a stable source of supply. Ukraine can take such action at will due to the lack of transparency in the system, citing the absence of technical gas—used to keep lines pressurized—in the pipeline or blaming Russia entirely for shutting off the gas. Conversely, given the opacity in its own system, Russia can make similar accusations against Ukraine with little chance of being caught in a lie.

The history of the gas dispute between Russia and Ukraine has its roots in the end of the Cold War. In the 1990s, after Ukraine gained its independence from Russia, the two countries had difficulty agreeing on terms of transit. On several occasions, Russia resorted to shutting off the flow of gas to Ukraine when it failed to pay accrued gas debts. (Russia alleged that Ukraine siphoned off Russian gas transiting to Europe as the reason for these shutoffs.) After several rejected formulations for settling the debt, Russia began to pay Ukraine for the cost of transit in gas, effectively linking Ukraine's own dependency on gas imports to Russia's payment for transit through its infrastructure. Nevertheless, issues surrounding previous debt to Gazprom and its actual value remained unresolved and were not settled until 2001.

After the 2001 agreement, the relationship between Russia and Ukraine remained rocky but quiet until Ukraine's Orange Revolution in 2004. Almost immediately after the bitterly contested election of pro-Western Yushchenko, Russia announced that it would reduce its gas subsidy to Ukraine, taking the position that gas subsidies were intended as a gift to a friendly government. Ukraine agreed to Russia's terms, but several months later almost 8 billion cubic meters (bcm) of gas that Russia had deposited in Ukrainian reservoirs disappeared. Due to the opacity and general disrepair of its infrastructure, Ukraine was able to declare with some credibility that it did not know what had happened to the gas.[12] Negotiations continued throughout 2005 but broke down when, on January 1, 2006, Russia cut off its supply of gas to Ukraine, which subsequently reduced the flow to its European customers. After 3 days of frantic negotiations, Russia and Ukraine agreed to new terms of transit.

For the next 18 months, Russia and Ukraine continued to renegotiate their transit arrangements. In early March 2008, Russia cut gas shipments by 50 percent for 2 days in retaliation for unpaid debt. Throughout the year, relations deteriorated. On January 1, 2009, Russia cut off its supply of gas to Ukraine. Over the next few days, Ukraine began to pass these reductions on to European consumers. On January 7, Russia stopped the flow of all gas to both Ukrainian and European customers. After 13 more days of heated negotiations, the countries arrived at a settlement and gas flow resumed. Customers across Europe had been left without heat and power, and the loss in revenue to both Russia and Ukraine was

significant. The shutoff caused Europe to lose much of its confidence in Russia's and Ukraine's ability to reach agreements that ensure the uninterrupted supply of gas. So far, however, these concerns do not appear to have had much effect on Europe's dependence on Russian gas.

While the primary cause of disputes in the 1990s was Ukraine's failure to pay for gas deliveries, the more serious breakdowns in negotiations following 2005 were mainly based in the political tension between Ukraine's new Western-leaning government and Russia's attempts to use gas as leverage to check Yushchenko's policies. Russia may not have believed it would get the higher prices it was asking of its former satellite but intended to use the ploy to gain leverage and get the Ukrainian government to make concessions in other areas. As Kyiv made clear its desire for North Atlantic Treaty Organization membership and increased ties with the West, Russia sought to raise the costs and hardships associated with such policies.[13] The continued increase in the cost of Russian gas to Ukraine was not without an economic basis, given that Gazprom found itself paying higher rates to Central Asian supplier countries, but it was also a means to exert control over Kyiv. The gas pricing disputes were a result of Ukraine being unable to pay the markedly increased costs and employing its own leverage as a transit country to Europe in price negotiations.

The nature of Russia's and Ukraine's energy industry has been a major part of the problem. Gazprom and Naftogaz remain state-controlled and -owned entities, vital to their respective countries. Gazprom energy exports are a key source of revenue for the Russian government, as is Naftogaz's energy transit infrastructure for Ukraine. The Russian government owns 50 percent of Gazprom, a controlling share, while Naftogaz is 100 percent state-owned. Its business negotiations are largely conducted by the national political leadership. Hence, it is subject to other political considerations and the context of relations between the two countries. Negotiations have always dealt with the question of gas pricing as part of a larger host of issues. The record shows a history of unstable deals that bundle Ukraine's gas import prices with various debts, tariffs, and transit prices. Ukraine has perpetually locked itself into unaffordable prices, creating debt, late payments, and adding to obligations in dispute between the two countries. It also consistently locks in import volumes well above domestic consumption requirements, avoiding reforms to its inefficient industry, and at times incurring penalties for not purchasing the contracted quota of gas.

Since the February 2010 election of Ukrainian President Victor Yanukovich, a distinctly more Russia-friendly leader, the two countries have signed a new pricing agreement. Ukraine will effectively pay 30 percent less than the originally negotiated price for 2010 (of $300 per 1,000 cm), which has been touted as producing over $40 billion in savings over the 10-year term of the agreement. Although advertised as a Russian return to the policy of gas subsidies for politically friendly states, this agreement is unlikely to prove more stable than previous arrangements. The deal is not particularly generous. Early in 2010, Gazprom renegotiated its major gas supply contracts with other European gas consumers because of falling market prices.[14] The lower rates Ukraine received simply brought the contract in line with rates being paid by EU customers. Beyond this, it is doubtful Ukraine could have afforded to pay the original higher gas prices.

The energy deal was not without a political context. Many observers commented that this deal was messily coupled with Ukraine's 25-year extension for Russian Black Sea Fleet basing rights in the Crimea, repeating the history of mixing gas pricing with political issues in Russia-Ukraine relations. As part of the deal, Ukraine also promised to import 40 bcm per year, well above domestic demand in 2008 and 2009.[15] In the fall of 2010, the agreement began to unravel ahead of the approaching winter, with the Ukrainian government claiming that the pricing agreement was unfair.

Legacy issues also arose with a ruling that Naftogaz unlawfully took 11 bcm during the 2009 gas crisis from RosUkrEnergo (RUE), a gas intermediary company

with 50 percent Gazprom ownership.[16] Following an arbitration court ruling, Naftogaz has reached a settlement with RUE, requiring it to return 12.1 bcm in confiscated gas and penalties. In exchange, RUE will repay a debt of $1.7 billion to Naftogaz and $810 million to Gazprom. The settlement results in a considerable cash gain for Gazprom and RUE while Naftogaz loses roughly $1.2 billion in gas that it must now return. In the ensuing controversy, the former prime minister, Yulia Tymoshenko, alleged that Ukraine had never intended to defend its case in court and the agreement was simply a back door deal profiting Gazprom and the tycoons behind RUE. The 2010 agreement gave Ukraine a temporary reprieve from addressing its domestic energy inefficiency, reforms to Naftogaz, and budget austerity measures to meet International Monetary Fund (IMF) loan conditions. This is yet another bad deal in a series of poorly negotiated agreements, and it is beginning to fall apart. More gas pricing disputes are almost certainly on the horizon.

the current global financial crisis has decreased Europe's demand for gas and created a glut that is reducing investor confidence in new pipelines

Potential Solutions

The situation in Ukraine is stable for the moment, largely due to IMF loans compensating for a considerable budget deficit, but the situation does not bode well for the country's future. Recent agreements with Russia appear to be only a temporary reprieve. Following a 15.4 percent GDP contraction in 2009, and with only a modest recovery in 2010, Ukraine will not be able to meet its obligations. It is doubtful that it can stick to IMF loan conditions without another round of negotiations on gas prices. A number of solutions (analyzed below) have been proposed for addressing the long-term problem of gas brinkmanship between Russia and Ukraine.

Development of Alternate Pipelines (Nord and South Stream). The most direct way to solve the problem between Russia and Ukraine is to diversify supply routes. If Ukraine lost its monopoly on transit, it would lose at least some of its ability to hold Russian gas hostage. Currently, Gazprom is diligently working to bring this about by building the Nord Stream and continuing to develop plans for the South Stream pipeline in order to circumvent Ukraine.

Although the new pipelines should prove helpful for practical reasons, the proposed Russian lines will not go far toward solving Europe's gas transit problem. The proposed Nord and South Stream pipeline projects together are expected to bring between 85 and 120 bcm of natural gas from Russia and the Caspian Sea to Europe.[17] Of these, the Nord Stream pipeline has the most potential and is the only one currently on schedule for completion. Heavily backed by Germany, the project has had no trouble obtaining financing. This route would link Russia and its largest gas customer, Germany, via the Baltic Sea. However, there are two problems. First, the current global financial crisis has decreased Europe's demand for gas and created a glut that, at least in the short term, is reducing investor confidence in new pipelines.[18] This glut has caused Russia to delay development of the Shtokman field that will supply Nord Stream; it remains to be seen whether Nord Stream will still be developed at the proposed capacity.[19] Second, and far more important, long-term European demand for gas is projected to increase faster than the pipeline will be able to supply it, even if the pipeline is built to planned capacity and Russia is able to develop Shtokman. Most analyses show European annual gas demand increasing by 200 bcm by 2025.[20] Nord Stream is only planned to provide Europe with 55 bcm annually.[21] Hence, not only will it fail to replace Ukrainian routes, it will only be able to relieve around a quarter of the expected increase in Europe's demand for gas.[22]

Russia's second pipeline planned to circumvent Ukraine, South Stream, is a joint project between Gazprom and the Italian company ENI. Once completed, it

will carry Russian and Central Asian gas from the Black Sea coast to Bulgaria and then bifurcate into a southern branch to Greece and Italy and a northern branch into Serbia, Hungary, and Austria. South Stream is projected to be completed in 2015, and Gazprom continues to claim that it will finance the project.[23] Its chief competitor, the proposed Nabucco pipeline, is the least attractive of the projects, costing more than the proposed Nord Stream but carrying only half as much gas (31 bcm).[24]

Unfortunately, South Stream is plagued by logistical and feasibility problems and remains entirely on paper. While building pipelines in the Black Sea is easier than in the Baltic, South Stream requires considerable technological expertise, most of which is being supplied by ENI. Due in part to the current gas glut, ENI's commitment to South Stream is shaky. Further complicating matters, in order to build the pipeline, agreements between Russia, the EU, and Turkey are required as South Stream's current route traverses Turkey's maritime exclusive economic zone.[25] So far, negotiations among Russia, ENI, and the relatively Russia-friendly governments in Bulgaria, Serbia, and Turkey are moving ahead, but work remains to be done before the project can begin.[26] Even if South Stream does eventually come online, it will only relieve a portion of the future increase in European demand. The proposed Nabucco pipeline promises to deliver even less gas than South Stream and faces similar feasibility problems.

Since the opening of a direct pipeline from Turkmenistan to China in 2009, which now carries shipments of gas from Uzbekistan as well, it is doubtful that Russia can actually secure the gas from Central Asia to fill all of these pipeline projects. When Russia lowered its purchase requirements, more Turkmen gas became available for export to China. While this does not compete with Russia's markets in Europe, it remains to be seen how much Turkmen gas will be available for Russia when European demand returns and steadily increases. Both Russia and Turkmenistan drastically decreased production in 2009 while witnessing an increase in proven reserves, but growing demand from China may force Russia to secure contracts with other suppliers, like Azerbaijan, to fill new pipelines. If either South Stream or Nabucco is developed, it will be some time before it becomes a viable supplement to the Ukrainian pipeline network. Currently, South Stream is in search of another partner company as it continues to work on agreements and study the feasibility of routes through Europe. Meanwhile, Nabucco has delayed the beginning of construction until 2012, having not yet secured the gas it intends to transport and supply, some of which it hopes will come from Iraq. Both projects face hurdles, ranging from the availability of supply to technical and legal issues. It is likely they will continue to face delays, especially given the current lack of demand, and even when completed will only provide alternate routes for a portion of future increases in gas demand.

Establishing a Consortium. A second potential solution to the Russia-Ukraine transit problems involves creating a transit consortium that includes Europe, Russia, and Ukraine. Proponents of this approach argue that such a mechanism could provide the balance both Russia and Ukraine seek in the gas transit equation. A European presence could grant Ukraine a Western ally and Russia a partner focused on long-term energy security for European residents. Various operational models are possible, including the consortium leasing or even purchasing partial ownership of Ukrainian gas pipelines. Selling part of the ownership rights to Ukraine's gas transit system to a consortium could raise significant capital for the struggling Naftogaz. Alternatively, a leasing option would allow Ukraine to retain ownership while granting the consortium operational control over the gas pipelines for a contracted amount of time. The EU would also benefit from taking an active role in the transit of gas from its

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supplier and become an effective mediator in any future disputes through its material stake.

In theory, an international consortium could go some way toward solving the problem of volatility in gas pricing disputes. From the EU perspective, it would allow Western players to ameliorate Russian leverage, provide greater protection to Ukraine, and enable greater transparency and accountability in the entire system. Unfortunately, the record of earlier proposals for such a solution suggests there is little impetus for Russia to join a consortium unless it gains the dominant interest.[27] Previous Russian offers for a consortium during the winter 2009 gas crisis included France's Gaz de France and Germany's E.On Ruhrgas (Nord Stream pipeline partner), but the dominant investment role was given to Gazprom. Thus, the Russian conception of such a venture is to include minority parties from Europe that are likely to defer to Gazprom, allowing it to slowly muscle out Ukraine's bankrupt Naftogaz. Last spring, Vladimir Putin announced his desire to see Gazprom merge with Naftogaz via an asset swap, openly stating Russia's desire to take over the company. In this conception, the EU would join the consortium after Gazprom had obtained a controlling share of Naftogaz. Russia has demonstrated no interest in dealing with the EU as a collective organization but rather focuses on key European countries and industry partners. Having already developed close ties with them, Russia would seek their inclusion in a consortium with the expectation that it could then leverage mutual interests in other ventures to gain their deference on Ukraine.

Ukraine's industrial sector has become the least energy efficient in Europe and one of the most inefficient in the world

Moreover, a real three-way partnership involving Europe would require transparency and accountability. The history of Russia-Ukraine business cooperation in the energy sector is full of shadowy intermediaries, secret investors, and opaque dealings on both sides of the border. It is unlikely that Russia would welcome a partner that attempted to shed light on these relationships or do away with corrupt business practices. Consequently, the only arrangement Russia would likely agree to would be one that did not give the EU added influence over its own energy security and that provided Russia with control over Ukraine's transit network and a stronger monopoly over the supply of gas to Europe. The closed-door deal between Russia and Ukraine reducing gas prices for 2010 is yet another example of how Moscow prefers to conduct business.

Nevertheless, with the recent election of a more Russia-friendly Ukrainian president, the possibility of a Russia-dominated consortium is becoming increasingly probable. Yanukovich has announced that he will seek to form a consortium with Russia and the EU, something his predecessors consistently ruled out. While the devil is likely to be in the details, Ukraine appears to be positioning itself to trade some ownership rights over pipelines for lower gas import prices. It has already exchanged Black Sea Fleet basing rights for a purported reduction in gas prices. The April 2010 agreement is a stopgap measure, based more in politics than economics. It allows Russia to show its good will toward Yanukovich and Ukraine while maintaining market gas prices and slowly pushing Ukraine toward concessions on infrastructure ownership. Russia has waited many years for this opportunity and is unlikely to settle for anything short of partial ownership of Ukrainian infrastructure and the ability to determine its European partners. Yanukovich will also have to overcome domestic hurdles to such a deal. The spectacle witnessed in Ukraine's Rada during debate on the recent gas agreement is a harbinger of things to come. Passing a law that cedes pipeline ownership to Gazprom will be both difficult and unpopular. If the current regime hopes to construct any deal on a consortium in the near future, it will require European participation as domestic political cover for concessions made to Russia. Yanukovich has

made clear his intention to make the EU a participant in any consortium discussions. If the Russian conception of EU participation wins out, giving itself the dominant and controlling stake, it will mean a Russian takeover of Ukraine's energy infrastructure.

Reforming Ukraine's Energy Sector. A third potential solution involves reforming Ukraine's energy sector. The country's infrastructure is a product of its Soviet inheritance, largely state-controlled, inefficient, and corrupt, with minimum transparency into operations. It does not operate at market rates due to heavy government subsidization of residential and commercial consumption. Over time, Ukraine's industrial sector has become the least energy efficient in Europe and one of the most inefficient in the world.[28]

Although the government has allowed domestic energy prices to increase since the end of the Cold War, Ukraine's politicians have not been willing to push prices up anywhere close to market rates. Such policies would force the country to become more efficient, but this efficiency would come at the price of considerable hardship to its citizens. As a state-controlled enterprise, Naftogaz continues to rely on cash infusions and state loans, which it had little trouble obtaining in the past, given that many of the company's shareholders were also members of the government.[29] Government support to Naftogaz amounted to 3 percent of GDP in 2009.[30] The current economic crisis has created incentives for reform, and the government announced that it will only pay up to 10 percent of fuel imports from the state budget, leaving Naftogaz on its own to find a way to cover the remaining import cost.[31] Domestic utility rates are set to gradually increase by 50 percent, which the government has blamed entirely on externally imposed conditions. Ukraine's political leadership has yet to claim ownership of any of these austerity measures, and it remains to be seen whether they will last.

The privatization and unbundling of Naftogaz is a long-overdue process that Ukraine is now forced to implement. Recently, Ukraine signed a gas market law and acceded to the European energy community, which will force it to unbundle the resource extraction and transit components of Naftogaz and subsequently make them publicly traded enterprises. It has also joined the Eurogas organization of European energy companies as an associate member. In effect, Ukraine's government is attempting to implement changes to its domestic energy sector

European investors will be skittish about investing in a public company that loses $1 billion annually and has yet to overcome legacy issues ranging from corruption to asset deterioration

and Naftogaz by having them imposed from the outside. Unfortunately, there is little public awareness, understanding, or support for any of these measures. With strong domestic interests opposed to reform, it remains to be seen whether any of these changes will be implemented.

The involvement of vested political interests will make privatization opaque and prone to becoming a giveaway of state assets at advantageous prices to various oligarchs. It could also create new shadowy intermediaries and additional players in the Ukrainian gas sector, akin to the former middleman RosUkrEnergo, with unknown shareholders and sources of funding. Undoubtedly, Gazprom would attempt to leverage its influence in the Ukrainian government and obtain as much infrastructure as possible via local proxies in such a process. Although this could make Gazprom acquisition of Naftogaz difficult via merger, it could also yield similar control. European investors will be skittish about investing in a public company that loses $1 billion annually and has yet to overcome legacy issues ranging from corruption to asset deterioration. Gazprom, however, will not be.

Foreign Investment. Under previous administrations, due in large part to fears of Russian influence,

Ukraine has demonstrated little interest in allowing foreign investment and control over its gas infrastructure and even passed laws barring foreign ownership of energy infrastructure.[32] The EU has long commented on the problems in its own energy security and Ukraine's infrastructure but has only recently become an active participant in the discussion on Ukraine's future after years of avoiding the issue. While Ukraine has been unwilling to open itself to Russian control due to fears that this will eventually lead to a de facto loss of sovereignty, it may find EU investment more acceptable. The country's past reluctance to allow foreign control of energy infrastructure is probably untenable given its current economic trajectory. Yanukovich's new policy toward Russia demonstrates recognition of this fact. Ukraine will be unable to sustain the existing gas sector as a wholly state-owned enterprise even with continued borrowing from the IMF and prospective borrowing from Russia or other countries. At best, these loans are a short-term solution to the government's budget deficit, which equaled 6 percent of GDP in 2009. Its recent agreements obligate it to privatize Naftogaz.

Ukraine has few alternatives. It is doubtful that the government can sustain a policy of reliance on IMF loans to compensate for its budget deficit and continued subsidization of Naftogaz. The existing requirement for external loans to pay for domestic gas consumption and maintenance of its energy infrastructure will only grow in 2011. Even following the recent renegotiation of gas prices, Ukraine's total payment for gas imports from Russia is still considerably increased from 2008 and the price is higher than what Western Europe pays today, further stressing its unsustainable economic policy.[33] Yanukovich's deal with Russia is beyond Ukraine's means and is likely a prelude to a future round of more serious concessions. It remains to be seen if Ukraine will stick to gradual domestic gas price increases that may or may not make Naftogaz economically viable.

Opening Ukraine to foreign investment with the intent of a partnership with the EU would represent a major step toward resolving the volatility of gas disputes and long-term issues in Ukrainian energy infrastructure. With EU investment and partial ownership of the infrastructure, Ukraine would gain an important partner, one likely to introduce both capital and greater transparency into its energy sector—something its government is unable to do. Early steps have already been taken in this direction, particularly the joint declaration from the March 2009 International Investment Conference on the Modernization of Ukraine's Gas Transit System. The conference demonstrated the EU's readiness to invest in a modernization and reform program for Ukraine's energy sector as part of a broader EU-Ukraine association framework, and its willingness to commit financial resources to help maintain Ukraine's infrastructure. This proposed program includes conditions focusing on

EU pipeline managers would be unlikely to divert European gas for Ukrainian use in the event that a dispute reaches the point of supply cutoffs

transparency, accountability, third-party access to the system, and Ukraine's assurance it would develop a viable gas reform plan.[34] The 2009 conference was a clear step toward increasing the EU's role in the Ukrainian energy sector and demonstrating its willingness to shoulder more responsibility.

An EU stake with partial ownership, should it materialize, will limit the possibility that a pricing dispute could lead to an energy crisis in Europe. EU pipeline managers would be unlikely to divert European gas for Ukrainian use in the event that such a dispute reaches the point of supply cutoffs. Russia has invited EU mediation in the past, and more robust foreign ownership would reduce Ukraine's ability to cut gas supplies off from its customers. Partial European ownership would also help to moderate Russia's ability to use gas prices as a tool to influence Ukraine politically, since such action

would force it to negotiate with EU companies. It would introduce transparency into gas transit and supply across Ukraine and limit the options for either country to use technical issues as a negotiating tactic.

EU investment could also modernize the pipeline infrastructure. Although it would likely lead to higher prices for Ukrainian domestic consumption, those increases would provide incentive for efficiency reform across the country's industries. While the EU has stepped in with $1.7 billion in loans in exchange for reforms to Ukraine's energy sector, this is woefully short of what Ukraine needs. The loans were intended in part to help Naftogaz settle its debt to Gazprom. The country is in dire need of investment, and its own optimistic figures show a minimum of $3 billion needed for infrastructure upgrades and maintenance.

Russian investment has a number of problems. Since Gazprom is 50 percent state owned, investment would not come without significant Russian government control. Given the long history of the Russian government mixing political and geostrategic concerns into Gazprom energy dealings, any significant investment would come with strings attached. The recent agreement is another indicator that Russia cannot separate Gazprom's energy dealings from other state interests. It also does not offer the same benefits because Gazprom suffers from many of the same problems as Naftogaz. It is grossly underinvested in infrastructure modernization and development of gas supplies while chained to a gas subsidy scheme in Russia that prevents it from selling gas domestically at market rates. These dynamics are likely to prevent Gazprom from being in a position to invest in modernizing Ukraine's infrastructure compared to a consortium of EU energy companies. It is more likely to see Ukraine's domestic energy market and infrastructure as a source of revenue rather than a place to invest capital.

If Gazprom did partner with Ukraine, it would likely attempt to capitalize on its increased market access and leverage in order to compensate for its own problems rather than introducing reforms and modernizing Ukraine's gas sector. Conversely, an EU investment would bring both modernization and transparency into European gas transit. Recriminations during the 2009 crisis demonstrated the effects of the absence of outside visibility into gas transit between Russia and Ukraine. This lack of transparency allowed Ukraine and Russia to continually employ brinkmanship in negotiations while blaming each other for the gas cutoff to Europe. Better visibility could substantially reduce the chances of a future cutoff.

Conclusion

The foundations for an energy security framework that ensures stability of supply to Europe will not be found in one solution. All of the options discussed here are being considered or implemented to various degrees. Alternative pipelines, if and when they are actually built, will reduce some effects of European gas demand growth on Ukrainian transit infrastructure, but they will not eliminate its importance in fulfilling European requirements for gas. Nor can Europe and Russia expect Ukraine to resolve its own problems. It lacks the money to modernize its infrastructure and is politically unable to privatize or institute significant reforms to its energy sector.

lack of transparency allowed Ukraine and Russia to employ brinkmanship in negotiations while blaming each other for the gas cutoff to Europe

Ukraine is in dire need of funds and must find a patron soon in either the EU or Russia. Failure to do anything will leave Ukraine on a collision course with Russia, the result of which could be another winter of interrupted gas supplies to Europe. Unless transparency increases significantly, both countries maintain the option of cutting gas supplies to Europe in a crisis and

blaming the other party for the shutoff. Ukraine's success in renegotiating gas prices this year falls far short of solving its long-term fiscal problems and will not satisfy Russia's desire to control Naftogaz. Unless it chooses to undertake a significant and active investment in Ukraine, the EU will continue to be a helpless consumer, trapped by the negotiations between Russia and Ukraine.

EU action has been relatively conservative. Thus far, only Germany appears to recognize the need for more serious and active involvement. The EU will need to present a more significant foreign investment offer to Ukraine or seek to establish a truly international consortium that includes European companies as equal shareholders along with Russia. Without greater EU investment, Ukraine is likely to cede investment and ownership rights over its pipeline network to Russia, with the outcome disadvantageous to itself and the rest of Europe. If this should happen, Russia will acquire greater influence on the Ukrainian political system by increasing its authority over domestic energy prices, thereby controlling a key sector of the economy and consumer spending. Gazprom is seeking the potentially lucrative Ukrainian domestic gas market for business reasons; the Russian government is doing so for the power it would gain from controlling energy prices in Ukraine. Putin's announcement in April was a clear first step toward Gazprom's takeover of Naftogaz. Such an outcome would significantly reduce Ukrainian sovereignty, and Moscow would be quick to translate its control of energy supply and transit into influence over or pressure on EU member states. This is not in the interest of either the European Union or the United States. Moreover, the disproportionate dependence of Eastern European countries on Russian gas could give Moscow the ability to exacerbate or manipulate tensions between Western and Eastern EU members.

The dire state of the Ukrainian economy and the recent election of a Russia-friendly government should provide the EU with greater impetus to act. Discussions in 2010 between Russia and Ukraine on a possible Gazprom takeover mean that time is a factor. EU investment to date and commitment to modernizing Ukraine's infrastructure are not proportional to the challenge the country faces. The EU should not look at Ukraine as a business opportunity alone, particularly in light of currently lagging gas demand, but should examine the long-term future of European energy security and the key role Ukraine will continue to play in it. Partnership with the EU is not a silver bullet for the troubled Ukrainian energy sector, but it is certain to reduce the volatility of future pricing disputes and is perhaps the only solution that does not leave Ukraine's fate entirely in Russian hands.

Notes

[1] European Commission, "Gas Impasse: Russia and Ukraine Fail to Resume Gas Deliveries to EU," *European Commission*, January 15, 2009, available at <http://ec.europa.eu/news/energy/090115_1_en.htm>.

[2] "Russia Agrees to Ease Ukraine Gas Supply Terms," BBC News, November 20, 2009, available at <http://news.bbc.co.uk/2/hi/8369705.stm>.

[3] "EU, Russia Strike Deal on Monitoring Gas Flow," CBC News, January 8, 2009, available at <www.cbc.ca /world/story/2009/01/08/europe-gas.html>.

[4] European Commission, *EU Energy in Figures 2010*, available at <http://ec.europa.eu/energy/publications/statistics/doc/2010_energy_transport_figures.pdf>.

[5] British Petroleum, "Trade Movements 2008 by Pipeline," in *Statistical Review of World Energy 2008*, available at <www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2009_downloads/gas_table_of_natural_gas_trade_movements_by_pipeline_2009.pdf>; Yu Xiang, "European Energy Security Challenges and Solutions," China Institute for Contemporary International Relations, 2009.

[6] Maureen Crandall, "Who is Bypassing Whom? Russian, European and Caspian Gas and Oil," paper presented at 32d International Association for Energy Economics Conference, 2009.

[7] Eurogas, "2007 Natural Gas Demand and Supply Long Term Outlook to 2030," available at <www.eurogas.org/uploaded/Eurogas%20long%20term%20outlook%20to%202030%20-%20final.pdf>.

[8] Russia further increases its leverage over Europe through tactics such as signing contracts with individual countries at discretionary prices, purchasing energy infrastructure in Europe, and strategically entering ventures with European energy companies.

[9] "Russia-Ukraine Gas Dispute Remains Unsettled," RIA-Novosti, December 20, 2005, available at <http://en.rian.ru/ russia/20051220/42586383.html>.

[10] "Ukraine: A Natural Gas Consortium Proposal," February 15, 2010, available at <www.stratfor.com/analysis/20100215_ukraine_natural_gas_consortium_proposal>.

[11] Bernard Gwertzman, interview with Steven Pifer, "Delivering Tough Love to Ukraine, Georgia," July 24, 2009, available

at <www.cfr.org/publication/19906/delivering_tough_love_to_ukraine_georgia.html>.

[12] Jonathan Stern, "The Russian-Ukrainian Gas Crisis of January 2006," Oxford Institute for Energy Studies, January 16, 2006, available at <www.oxfordenergy.org/pdfs/ comment_0106.pdf>.

[13] Radio Free Europe/Radio Liberty, interview with Celeste Wallander, "Russia: Moscow and Energy Leverage," December 5, 2005, available at <www.rferl.org/content/article/1063524.html>.

[14] Edward C. Chow, "Energy Bungling," *The Kyiv Post,* August 29, 2010, available at <www.kyivpost.com/news/opinion/op_ed/detail/80304/>.

[15] Ibid.

[16] "Ukraine Challenges 1.7bln Gas Deal with Russia," Reuters, October 13, 2010, available at <http://af.reuters.com/article/energyOilNews/idAFLDE69C0TF20101013>.

[17] Jason Bush, "Gas Pipelines: South Stream Gets a Boost," *Business Week*, May 18, 2009, available at <www.businessweek.com/globalbiz/content/may2009/gb20090518_424303.htm>.

[18] See, for instance, "Natural Gas, An Unconventional Glut," *The Economist*, March 11, 2010, available at <www.economist.com/business-finance/displaystory.cfm?story_id=15661889>.

[19] Guy Chazan, "A New Route for Natural Gas to Europe," *The Wall Street Journal*, November 6, 2009, available at <http://online.wsj.com/article/SB125743139771530815. html>; "Nord Stream," available at <www.nord-stream.com/en/>; "Natural Gas, An Unconventional Glut."

[20] Chazan; Paul J. Saunders, "Russian Energy and European Security: A Transatlantic Dialogue," The Nixon Center, February 2008, 14, available at <www.nixoncenter.org/monographs/saunders08.pdf>.

[21] Chazan; "Nord Stream."

[22] A consideration that we do not address here is the possibility that European gas production will increase due to new shale gas extraction techniques. While these techniques have played an important role in the United States, there is little agreement about how much impact they will have in Europe.

[23] Bush.

[24] Radio Free Europe/Radio Liberty, "Factsheet: Russian Gas Export Pipelines," available at <www.rferl.org/content/Russian_Gas_Export_Pipelines_Projects/1366873.html>.

[25] Boris Nemtsov and Vladimir Milov, "Putin and Gazprom: An Independent Expert Report," Moscow, 2008, 21, available at <www.docstoc.com/docs/1603180/Nemtsov-White-Paper-Part-II----Gazprom>.

[26] "Russia, Italy: A Productive Agreement on South Stream," May 15, 2009, available at <www.stratfor.com/analysis/20090515_russia_italy_productive_agreement_south_stream>.

[27] Judy Dempsey and Stephen Castle, "Putin Proposes Deal to Settle Gas Crisis," *The New York Times*, January 16, 2009, available at <www.nytimes.com/2009/01/16/world/europe/16iht-gazprom.4.19439569.html>.

[28] International Energy Agency, "Ukraine Energy Policy Review," OECD, 2006.

[29] Edward C. Chow and Jonathan Elkind, "Where East Meets West: European Gas and Ukrainian Reality," *Washington Quarterly* 32, no. 1 (Winter 2008/2009), available at <www.twq.com/09winter/docs/09jan_ChowElkind.pdf>.

[30] Economist Intelligence Unit, "Country Report: Ukraine," March 2010.

[31] Daryna Krasnolutska, "Ukraine Tells Naftogaz to Pay for Russian Gas, Seeks Price Cut," *Business Week*, March 19, 2010, available at <www.businessweek.com/news/2010-03-19/ukraine-tells-naftogaz-to-pay-for-russian-gas-seeks-price-cut.html>.

[32] Stern; Vladimir Socor, "Russia Seeks Control of Ukraine's Gas Transit System Through a Consortium," *Eurasian Daily Monitor* 6, no. 9 (January 15, 2009), available at <www.jamestown.org/ single/?no_cache=1&tx_ttnews%5Btt_news%5D=34357>.

[33] Edward C. Chow, "Bad Deal All Around," *The Kyiv Post*, April 26, 2010.

[34] Joint EU-Ukraine International Investment Conference on the Modernization of Ukraine's Gas Transit System, Joint Declaration, March 23, 2009, available at <http://ec.europa.eu/external_relations/energy/ events/eu_ukraine_2009/joint_declaration_en.pdf>.

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